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esis in several species of *Stenobothrus* that the chromosomes of the spermatocytes are made up of rods, sometimes 2 and sometimes 4. The length of these rods varies in arithmetic progression. In each of 4 species studied there are 5 short chromosomes, no two of which are the same length; altho the 5 short chromosomes in one species correspond with the 5 short ones of the others. There are also 3 larger chromosomes in each species, but these long chromosomes do not belong in the different species to the same numerical series. The author believes that the external specific differences between the species are dependent on the differences in the long chromosomes, altho he is unable to establish the correlation between the rod-lengths and the body characteristics.

#### SPERMATOGENESIS IN HYBRID PIGEONS

Smith (Quart. J. Mic. Sci. 1912, p. 159) reports studies of the sperm formation and structure in the hybrids formed by mating a male pigeon and female domestic dove, and compares these with the condition in pure breeds.

In the first maturation division in the hybrids the chromosomes do not unite to form 8 bivalent chromosomes but occur quite irregularly about the spindle and are finally distributed to the poles irregularly.

The second maturation division is practically suppressed. The secondary spermatocytes proceed at once to form spermatids and spermatozoa. Many of these are on the average twice the normal size, altho otherwise apparently normal structurally. In other cases there were structural abnormalities.

It is known experimentally that hybrids of these stocks are infertile, and it seems that the sterility may be due to the inability of the specifically different chromosomes to unite in the normal synapse, with the consequent disturbance in the whole maturation process.

#### MALE GERM CELLS IN NOTONECTA

Browne (Jour. Exp. Zool. Jan. 1913) discusses the differences in form and number of the chromosomes in three species of *Notopecta*. She finds that the differences in the chromosome condition may be explained in these species by the relations of two particular

chromosomes. In *N. undulata* the two chromosomes in question are always separate; in *N. irrorata* are always united to form a single body; and in *N. insulata* they may be separated in the first spermatocyte division, but are united in the second.

The author traces the origin of the chromosomes from the karyosphere in the three species, and their behavior in the growth stages and maturation divisions.

#### INTERSTITIAL CELLS OF TESTIS AND SECONDARY SEX CHARACTERS

J. des Cilleuls (C. R. Soc. Biol. Paris, 1912, p. 371) finds a strict coincidence in the development of the interstitial cells of the testis and the secondary sexual characteristics of the cock. In chickens the external marks of sex do not begin to appear until about the thirtieth day. By the time the chicks are 45 days old the pullets show a greater development of the tail feathers and the cockerel more color and size of comb. The sex distinctions increase from this point. The author claims that the secondary sex characters in the male bird begin to show with the oncoming of the interstitial cells, and increase as these increase. The author believes that the secretion of the interstitial cells acts as a hormone in stimulating the growth of the characteristic male secondary structures.

#### MICROBIOLOGY IN RELATION TO DOMESTIC ANIMALS

This book, entitled "Principles of Microbiology," with a subtitle "A Treatise on Bacteria, Fungi, and Protozoa Pathogenic for Domesticated Animals," is written primarily for veterinary students beginning the study of microbiology. It consists, in about equal parts, of matter belonging to general bacteriology and to special applications of this to veterinary science. In the very nature of the case this makes the treatment of general bacteriology somewhat less satisfactory than may be had from text-books on this subject, and limits the author somewhat in his treatment of the part of the subject which is peculiar to the book.

The first twelve chapters are given to such subjects as the biology, morphology, classification of bacteria; the apparatus, methods of sterilization, cultivation, staining, and examination of bacteria; the relation of bacteria to disease. In the part relating to